# Solar Food Dryer

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## TOOLS:

- Box cutter (1)
- Framing square (1)
- Marker (1)
- Metal chop saw (1)
- Staple gun and staples (1)
- Tape measure (1)
- Tin snips (1)
- Welding, either wire welder or gas welder. (1)
- Wood saw (1)

## PARTS:

- Steel tubing (1)
  *1" square, 40'*
- Sheet metal (1)
  *Galvanized, 16' X 3'*
- Polycarbonate panel (1)
  *Flat, 2'x8', translucent. Sold for greenhouses and patio covers.*
- Hinges (2)
- latch (1)
- Silicone caulk (1)
- Dimensional lumber (11)
  *1x2, 8' lengths*
- Food-safe screen (1)
  *16'x2'*
- Thin wooden molding (2)
  *48" lengths*
- Sheet metal screws, self-tapping (100)
- Wood screws (50)
- Black paint (1)

## SUMMARY

If you're growing your own fruit and vegetables, or just trying to eat food that's produced locally, you come across one obvious problem: when something is in season, you have more than you can handle, and then there's nothing for the rest of the year.

The obvious solution is to preserve your food when you have it in abundance, and drying with the sun is one of the easiest, most energy-efficient ways to do so. It also maintains a lot more of the original nutrients than canning or freezing.

The concept of a solar dryer is simple: move warm air over thinly sliced food. The warmer the air, the more moisture it can remove from the food. However, you don't want the air to move too quickly, as it will cause the temperature to decrease. Our design creates just enough air movement and warmth to dry food quickly.

The food is laid out on trays, which sit behind a transparent polycarbonate sheet. Below the trays there's a metal shelf, painted black, that serves as a heat absorber. As heated air rises through the food, cool air is drawn in through the bottom vent, and the heated, moisture-laden air flows out the exhaust at the top.

Because the dryer is something we plan to use for many years to come, we decided to make ours out of metal. If you don't have access to a welder, you can make the frame out of wood, but you'll need to adjust these plans accordingly.

## Step 1 — Make the frame.

- You can make the frame any size you want, but I settled on 48" long by 18" wide. This was the size that I could cover with one sheet of 24"×96" polycarbonate.
- Cut 3 lengths of square tubing 46" long, and 2 lengths of 48". These will be the horizontal beams of the frame.
- Cut 2 lengths 34" long and 2 lengths of 22", for the upright pieces of the frame.
- Place the two 34" uprights on a level surface. Mark each one 3" from the bottom and 10" from the top. Place a 46" beam between the 2 uprights, below the 3" mark, and weld it in place. Place another beam between the 2 uprights, above the 10" mark, and weld it in place. This is the front (or door) panel.
- Weld the 22" uprights between the 48" beams to form a big rectangle. Be sure to put the beams above and below the uprights, not between them, so that everything will come out to be 48" long. This is the back panel.
- With the back and front panels welded, it’s time to lay out the sides. Stand the back panel up vertically on a level surface. For the bottom sidepieces, cut two 20" lengths of square tubing and lay them down, butted against the back panel, one on each side. Stand the front panel up vertically on top of these sidepieces. (Clamp or tie both vertical panels to something to keep them upright.) Square the bottom sidepieces with the uprights and clamp them all in place.
- Now cut 2 lengths of square tubing that will connect the tops of the front and back panels. Because the front is taller than the back, these 2 top sidepieces will be angled. Hold a piece of square tubing roughly in place and mark it so that it fits in between the front and back panel. Repeat for the other side. If your panels are level and square, these top sidepieces should be the same size.

## Step 2

- Clamp the 2 top sidepieces in place between the front and back panels, and then weld the 4 clamped joints, checking square periodically.
- Lay the unit down, so that the taller, front (door) panel is on the floor and the bottom is facing you. Insert the last 46" horizontal beam into the bottom panel, about 4" up from the front panel. This will frame the bottom vent. The dryer frame is done.

## Step 3 — Make the door.

- Cut two 47" beams and two 19½" uprights, and place them over the opening of the front (door) panel to check for size. Make sure you put the beams above and below the uprights, not in between them, so that the door will measure 47" long by 21½" tall. You want the door panel to overlap the frame about ¼" on all sides. Weld the door frame together.
- Cut a piece of sheet metal 47"×21" and attach it to the door frame using the drill and sheet metal screws. The door is done. You'll attach it after everything else is completed.

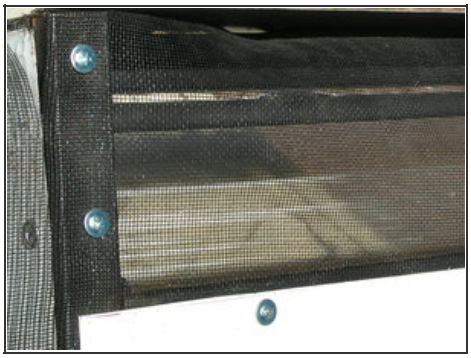
## Step 4 — Add tray supports and the heat absorber.

- Before you cover the frame, install the tray supports while there's still plenty of room to work. Start by cutting ten 21" lengths of 1×2 lumber.
- Mark all 4 of the uprights 4" up from the bottom bar. Proceed to mark the uprights at 4" intervals. You should have 5 marks on each upright.
- Using sheet metal screws, attach the 1×2 boards inside the dryer frame, between the front and back panels at each mark.
- Cut a piece of sheet metal 48"×18" for the heat absorber. The absorber sheet sits on top of the lowest tray support boards and the bottom beam of the door panel. (You'll need to cut out its front corners to fit around the uprights.) Screw it in place with wood screws and sheet metal screws. The absorber sheet doesn't go all the way to the back panel; there's a gap of about 3½".

## Step 5 — Cover the frame.

- Cut the polycarbonate sheet in half, to give you two 24"×48" sheets. Use a box cutter to score and then slice the polycarbonate.
- Clamp each piece to the outside of your welded frame, one on top, and one on the back panel. Make sure they cover the frame well. Don't clamp so tightly that the polycarbonate breaks.
- Pre-drill holes around the perimeter of the polycarbonate for screws, and use sheet metal screws to attach the polycarbonate to the metal frame.
- Cut pieces of galvanized sheet metal to cover the sides. It's easiest if you cut a sheet 21" wide by 35" long and then trace the frame out on the metal to get an exact fit. Screw the sheets to the frame with sheet metal screws.
- Also cut a piece of sheet metal 18"×48" to cover the bottom, but don't attach it yet. There will be a 4" gap on the front (door) panel side of the bottom plate. This gap will become the intake vent.
- Cut pieces of sheet metal 4"×48" and 8"×48" but don't attach them yet. You'll attach these to the front panel, below and above the door opening, respectively, leaving a 2" gap at the very top for the exhaust vent.

## Step 6 — Screen the vents.



- Cut 2 pieces of screen, 6"×50", which will cover the intake and exhaust vents to prevent insects from entering the dryer.
- Cut 2 lengths of molding, 48" and 46". Staple one of the pieces of screen to the 48" molding, along the edge of the screen. Using a few small screws, attach this molding to the underside of the top polycarbonate panel, so that the screen hangs down the front (door) panel. Attach the sides of this screen to the dryer frame using one screw on each side.
- Place the other piece of molding between the uprights of the front (door) panel on the inside of the sheet metal at the top. Screw it in place and staple the loose edge of the screen to it.
- Attach the bottom screen with a few screws on the sidebars to hold it in place.
- Now screw the sheet metal to the bottom and front (door) panel. Make sure the screen lies in between the sheet metal and frame for a secure and insect-tight fit.

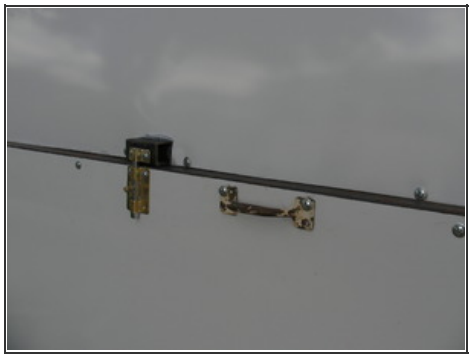
## Step 7 — Seal and paint

- Caulk all the edges and seams of the sheet metal and polycarbonate panels with silicone caulk. Paint the entire inside black, focusing especially on the heat absorber and sides.

## Step 8

- Make the drying trays
- Cut 1×2 lumber to 8 lengths of 46" and 12 lengths of 19½". Screw and glue these boards together into 4 rectangular tray frames measuring 46"×21½" with a support board in the middle of each. Make sure the rectangles are nice and square.
- Cut 4 pieces of screen 54"×28". Fold screen around the edges of each frame and staple it to the boards, pulling it tight as you go along.
- Attach 2 screws for guides on the underside of each tray, one on each side. The screws should be about 1" from the end of the tray. Don’t screw them in all the way; leave about ½" of the screw sticking out. These guides make it easier to slide the tray in and out of the dryer.

## Step 9



- Attach the door
- Attach the door with hinges and a latch. And you're done!

## Step 10 — Use it

- Before using, make sure the dryer sits in the sun for a few days to allow any fumes from the paint and silicone to escape. Then test the dryer using 2 trays at a time, increasing to 4 trays if the weather is clear and dry. Slice food as thin as possible (¼") to hasten drying time.
- I like to keep an oven thermometer in the dryer to see the temperature inside. Ideally, you want it to be about 130°F inside. If the temperature is lower than this, reduce the size of the bottom vent with a piece of cloth.
- Foods can be rehydrated before using, if needed. You can dry leaves, roots, fruits, vegetables, nuts, fruit pulp, and anything else you can think of.
- More photos and food drying resources at: http://www.velacreations.com/solarfooddr...

This project first appeared in MAKE Volume 26.

This document was last generated on 2012-10-31 06:08:44 AM.